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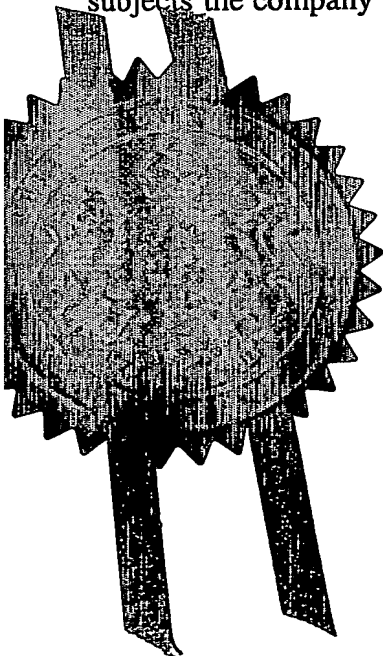
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1. Your reference

2040-P141-GB

0205716.4

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3. Full name, address and postcode of the or of each applicant (underline all surnames)

ELEKSEN LIMITED  
Charter Court  
Midland Road  
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UK

Patents ADP number (*if you know it*)

8288920001

If the applicant is a corporate body, give the country/state of its incorporation

United Kingdom

4. Title of the invention

FLEXIBLE FOLDABLE KEYBOARD

5. Name of your agent

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Patents ADP number

7807043001

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Claim(s)

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I/We request the grant of a patent on the basis of this application.

Signature

Date Monday, 11 March 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

RALPH ATKINSON CPA  
0114 275 2400

DUPLICATE

## Flexible Foldable Keyboard

### Background of the Invention

#### 1. Field of the Invention

5 The present invention relates to a flexible foldable keyboard apparatus configured to communicate with a mobile telephone.

#### 2. Description of the Related Art

10 The transmission of text messages using cellular mobile telephones is well established. Under the GSM system for example, it is possible to transmit relatively large volumes of data usually obtained from an external processing environment, such as a laptop computer. In addition, the GSM recommendations also provides for smaller messages to be generated directly from the keyboard of the mobile telephone using the short message services (SMS) facility. Thus, SMS messaging, or "texting" has an advantage  
15 in that it is not necessary to provide additional processing systems given that the message may be generated exclusively by the component mobile telephone itself. However, a disadvantage of SMS messaging is that typical keyboards for mobile telephones do not facilitate the generation of text  
20 messages.

It has been appreciated that many users would make greater use of SMS messaging if the generation of text data could be made easier without impacting upon the inherent portability of the mobile telephone device.

### Brief Summary of the Invention

According to a first aspect of the present invention, there is provided a flexible foldable keyboard apparatus configured to communicate with a mobile telephone, comprising a key-defining flexible plane; an interface device; and a telephone support means, wherein said telephone support means is arranged to unfold from said flexible plane so as to present a phone supporting configuration for a mobile phone and, after removing a secured mobile phone, said support means is arranged to fold onto said key defining surface into a storage configuration, thereby allowing said key defining surface to be wrapped around said folded phone support means.

In a preferred embodiment, the telephone support means includes a front portion and a rear portion connected by a hinge, wherein the telephone is received between the front portion and the rear portion. Preferably, the mobile telephone may only be received within the support device when the support device is in its fully unfolded configuration. Furthermore, the support device may only allow a telephone to be connected to interface devices when the telephone is located in a correct orientation.

According to a second aspect of the present invention, there is provided of communicating text data to a mobile telephone using a flexible foldable keyboard, comprising the steps of unfolding a telephone support means from a flexible plane so as to present a telephone supporting configuration for a mobile telephone; inserting said telephone within said unfolded telephone support means; manually operating keys defined with said flexible plane to input data; removing said telephone from said unfolded

support means; folding said support means onto said key defining plane; and wrapping said key defining plane around said folded telephone support means.

## 5      **Brief Description of the Several Views of the Drawings**

*Figure 1* shows a flexible folded keyboard, with a support device;

*Figure 2* shows the unfolding of said support device;

*Figure 3* shows the support device in its unfolded configuration;

*Figure 4* shows the support device supporting a mobile telephone;

10      *Figure 5* illustrates the removal of the telephone from the support device;

*Figure 6* shows the wrapping of the keyboard around the support device;

*Figure 7* shows the further wrapping of the keyboard around the support device;

15      *Figure 8* details the construction of the support device;

## **Written Description of the Best Mode for Carrying Out the Invention**

### ***Figure 1***

20      A flexible folded keyboard **101** is shown in *Figure 1*. The keyboard has a key defining flexible plane **102** on which key positions are slightly raised and have text printed thereon. Alternatively, the keys could be left flat without being raised up from the flat plane of the keyboard. The apparatus also includes a telephone support device **103**, for receiving a

mobile cellular telephone of a type capable of transmitting text data by wireless means. This includes data transmissions in accordance with the GSM standard and text messages sent using the small message services (SMS) provision of GSM. Furthermore, larger documents may be supplied using GPRS standards, including multi-messaging services (MMS). Furthermore, mobile telephones are becoming available that have additional functionality such as that provided personal digital assistance (PDA's). Thus, in accordance with these platforms, running independent applications, it is possible to generate e-mails and text documents that could then be transmitted over the telephony connection for reception by colleagues or associates using similar platforms or for dissemination within a network environment for further application on, for example, officer personal computers.

Mobile telephones includes electrical connectors to facilitate the transmission of data with external devices and the foldable keyboard apparatus is provided with a interface device configured to connect with the electrical connectors of a mobile telephone. In addition, the device may also be provided with means for recharging the mobile telephone while positioned within the support device 103 when the support device 103 is arranged in a supporting configuration. The device may also include an electrical storage battery which may be recharged from an external power supply. Consequently, it is possible for an internal battery for the keyboard device to be recharged in parallel with a telephone recharging operation.

**Figure 2**

In response to manual operation, as illustrated in *Figure 2*, the support device 103 is arranged to unfold, as shown generally by arrow 201, from the flexible keyboard plane 102 such that, when completely unfolded, the telephone support device presents a phone supporting configuration, as illustrated in *Figure 3*.

**Figure 3**

When completely unfolded into it's phone supporting configuration, the phone support device 103 defines a front supporting element 301 and a rear supporting element 302. In addition, the phone supporting device includes a base connecting sub-assembly 303 and an extension arm 304. The base connecting sub-assembly 303 provides physical connection to the key defining flexible plane 102 and also provides support for the base of the telephone. In addition, the base connecting section 303 also protects electrical connections between the key defining flexible plane 102 and the electrical interface to the mobile telephone.

The rear supporting element 302 consists of two substantially vertical elements connected by a horizontal element 304. A mobile telephone is inserted into the support device and held between the front supporting element 301 and a rear element 304. The space between elements 301 and 304 is such that a mobile telephone can only be inserted when the supporting apparatus is fully erect. This ensures that the phone is inserted in a preferred orientation so as to ensure that the connection



between electrical connectors of the support device and electrical connectors of the mobile phone meet in a preferred orientation thereby ensuring that no damage is introduced to the connectors of either party. It is also preferable for the supporting device to be relatively thin when in its folded configuration so as to minimise the overall size of the device when the keyboard is wrapped. However, when in its open configuration, the aperture presented for receiving the telephone must be sufficient to connect with the full depth of the telephone.

#### **Figure 4**

In use, a cellular mobile telephone **401** is located between the front supporting element **301** and the rear supporting element **302**. Operation of the keyboard occurs substantially as described in international patent application WO 00/72239, assigned to the present assignee, the contents of which are incorporated herein by reference. The contents of United States pending patent application number 09/744,155 are also incorporated herein by reference.

In summary, the defining flexible plane **102** includes a plurality of electrically conducting fabrics such that by establishing potential gradients across said fabrics, it is possible to identify the location of a mechanical interaction. Electrical power for the provision of this functionality is derived from the storage batteries of the mobile telephone. Processing devices attached to the base connecting sub-assembly **303** are configured to identify key press locations and interaction extent by voltage and current

measurement. This information is conveyed to the mobile telephone whereupon program instructions held within the mobile telephone are configured to convert these positions and extent values into key press locations. In this way, it is possible for text data to be supplied to the mobile telephone via the flexible keyboard 102 in preference to using the key pad 402 of the mobile telephone 401. However, given that the mobile telephone 301 is supported firmly between the front supporting element 301 and the rear supporting element 302, it is possible for keys of keypad 402 on the mobile telephone to be used by a user in a one handed manner given that the phone support device 103 holds the telephone in place and maintains its connection to the interface device. In addition, the underside of the key defining flexible plane 102 includes rubber-like material (a silicone rubber edge for example or similar) so as to resist slipping over a table or similar support when force is applied in the direction of the telephone keys as distinct from the keyboard keys.

The rigid construction of the telephone support device 103 is facilitated because it is only desirable to have the telephone connected to the interface device when the foldable keyboard apparatus is unfolded into its supporting configuration as shown in *Figure 4*. The flexible foldable nature of the keyboard provides portability such that, when folded, the keyboard may be stored easily in a handbag or pocket etc.

After use has been made of the keyboard apparatus, the mobile telephone 401 is removed by the application of a longitudinal force. The mobile telephone may then be returned to a pocket or alternative storage

location for continued use in its primary role, that is to say, for voice communication. As previously stated, the flexible keyboard, when folded, may be stored in another pocket and reconnection may be established, as described previously with reference to *Figures 1 to 4*, should additional text messaging be required. Thus, for example, a user may be prompted to assemble the device as previously described and generate text data in response to receiving a text message. A user therefore has significant benefits in that the flexible foldable keyboard detracts very little from the portability of the apparatus but, when connected, provides significant enhanced functionality given that the user now has access to a substantially full sized fully functional keyboard.

An alternative embodiment to using a fabric keyboard is described in international patent publication WO 01/75572, the contents of which is incorporated herein by reference. A similar disclosure is also included in co-pending United States patent application number 09/980,236, the contents of which is also included herein by reference. In the alternative embodiment, the keyboard is a membrane keyboard having an uppermost layer of silicone rubber. This silicone rubber layer is laminated on its upper surface with a durable fabric layer onto which graphical icons and alpha numerics are printed. Alternatively, the uppermost layer is laminated with a durable flexible plastic film, such as a film of polyester or polyvinylchloride, onto which the graphics etc have been printed.

The alternative membrane keyboard includes a first electrically conductive membrane film and a second electrically conductive membrane

film. In addition, a spacing membrane layer is positioned between the first electrically conductive membrane layer and the second electrically conductive membrane layer.

The first electrically conductive membrane layer is a film of MYLAR <sup>RTM</sup> (polyethylene terephthalate. Electrodes are printed onto the underside of the film thereby forming a conductivity channel for the first electrically conductive membrane. The electrodes are connected to an interface circuit that supplies voltages to these electrodes via conductive tracks. Each electrode is specifically aligned so as to correspond with a key registration device on the outermost layer.

The second electrically conductive membrane layer is also composed of a MYLAR <sup>RTM</sup> membrane having electrodes printed thereon. Each of the electrodes printed onto the upper surface layer is aligned with a corresponding electrode on the co-operating layer and a corresponding key registration device on the outermost layer.

A separator layer is provided in the form of a non-conductive membrane sheet of MYLAR <sup>RTM</sup> with holes located to coincide with the positions of the co-operating electrodes. The separator layer prevents electrical contact occurring between the electrodes of the layers unless a mechanical interaction has occurred by the pressing of a specific key. Alternatively, the membrane layers may be made of alternative plastics materials.

**Figure 5**

After removing the mobile telephone from the support device, as previously described, the support device in **103** is arranged to fold onto the key defining surface **102**, as shown in *Figure 5*. Thus, having removed the mobile telephone, manual force is applied substantially in the direction of arrow **501** in order to effect the folding of the support device onto the plane of the flexible keyboard **102**. When in its folded configuration, the support device should add relatively little depth so as to minimise the size of the keyboard apparatus when wrapped. Typically, the thickness of the support device should be less than the thickness of a typical mobile telephone. However, when in its unfolded configuration, the support device should provide an opening that allows the mobile telephone to be received. The opening should be of a sufficient size only when the support device is fully open. In this way, the mobile telephone is guided into position so as to ensure satisfactory connection between the respective electrical connectors of the support device and the mobile telephone. This ensures that error-free data communication takes place and also ensures that the electrical connectors of the mobile telephone are not damaged.

**Figure 6**

Having fully folded the telephone support device into the storage configuration for the device, the flexible keyboard is now wrapped around the folded support device in order to facilitate subsequent storage. This folding process is initiated by folding a first side of the keyboard **601** onto,

the telephone support device.

**Figure 7**

Having made a first fold of the flexible keyboard as illustrated in  
5 *Figure 6*, the opposing keyboard side 701 is folded over the first previously  
folded side so as to provide a relatively compact package, as shown in  
*Figure 7*, that is easily stored in a pocket, handbag or similar device.

In its folded configuration, the flexible keyboard effectively provides a  
wallet for the support device for the mobile telephone. Consequently, this  
10 functionality could be extended to provide storage for other often  
transported items such as credit cards, business cards, currency, door  
keys, passes, driving licences and so on. Thus, this functionality could be  
facilitated by the provision of additional pockets within the foldable flexible  
keyboard apparatus within the support device itself.

**Figure 8**

A telephone support device 103 is detailed in exploded view in  
*Figure 8*. Front supporting element 301 is connected to rear supporting  
element 302 by hinge pins 801 and 802. Similar pins 803 and 804 connect  
20 the extension arm 304 to the rear supporting element 302. The base  
connecting sub-assembly 303 consists of a sensor tail housing 805, a PCB  
cover 806 and a key mat clamp 807. PCB cover 806 covers a printed circuit  
board 808.

A keyboard designed for use with mobile telephony equipment may

have slightly different configurations to keyboards used for other equipment, such as personal digital organisers. In particular, many mobile telephones do not include touch screens or similar devices and navigation between menus is achieved using specific navigation keys present within the mobile telephone itself. Consequently, in such circumstances, it is desirable to have similar navigation keys provided on the flexible keyboard.

**Claims:**

1. A flexible foldable keyboard apparatus configured to communicate with a mobile telephone, comprising

5 a key-defining flexible plane;

an interface device; and

phone support means, wherein

said phone support means is arranged to unfold from said flexible plane so as to present a phone supporting configuration for a mobile phone

10 and, after removing a secured mobile telephone,

said support means is arranged to fold onto said key defining place into a storage configuration, thereby allowing said key defining place to be wrapped around said folded telephone support means.

15 2. A keyboard apparatus according to claim 1, wherein said key-defining flexible plane includes a plurality of textile fabric layers.

3. A keyboard apparatus according to claim 1, wherein said key-defining flexible plane includes conductive membrane films.

20 4. A keyboard according to claim 1, wherein said telephone support means includes a front portion and a rear portion connected by a hinge, wherein said telephone is received between said front portion and said rear portion.



5. Apparatus according to claim 4, including a base portion and an extension portion such that, in combination with said front portion and said rear portion, a substantially quadrilateral configuration is produced.

5

6. A keyboard according to claim 5, wherein said base portion is a sub-assembly arranged to support a circuit board.

10

7. Apparatus according to claim 1, wherein said flexible foldable keyboard apparatus is configured to communicate with mobile telephones having advanced features, including features to assist with the generation of text documents and electronic communications.

15

8. Apparatus according to claim 7, wherein said keyboard includes keys to assist menu navigation.

20

9. Apparatus according to claim 1, wherein said support device is less thick than a co-operating mobile telephone when said support device is placed in its folded configuration.

10. Apparatus according to claim 1, wherein said mobile telephone may be received within said support device only when said support device is in its fully unfolded configuration.

11. Apparatus according to claim 10, wherein said support device only allows a telephone to be connected to interface devices when said telephone is located in a correct orientation.

5 12. Apparatus according to claim 1, including an independent power supply.

13. Apparatus according to claim 12, wherein said power supply receives recharging current from an external charging source.

10 14. Apparatus according to claim 13, wherein said charging current is also used to recharge a mobile telephone device.

15 15. A method of communicating text data to a mobile telephone using a flexible foldable keyboard, comprising the steps of

unfolding a telephone support means from a flexible plane so as to present a telephone supporting configuration for a mobile telephone;

inserting said telephone within said unfolded telephone support means;

20 manually operating keys defined within said flexible plane to input data;

removing said telephone from said unfolded support means;

folding said support means onto said key defining plane; and

25 wrapping said key defining plane around said folded telephone support means.

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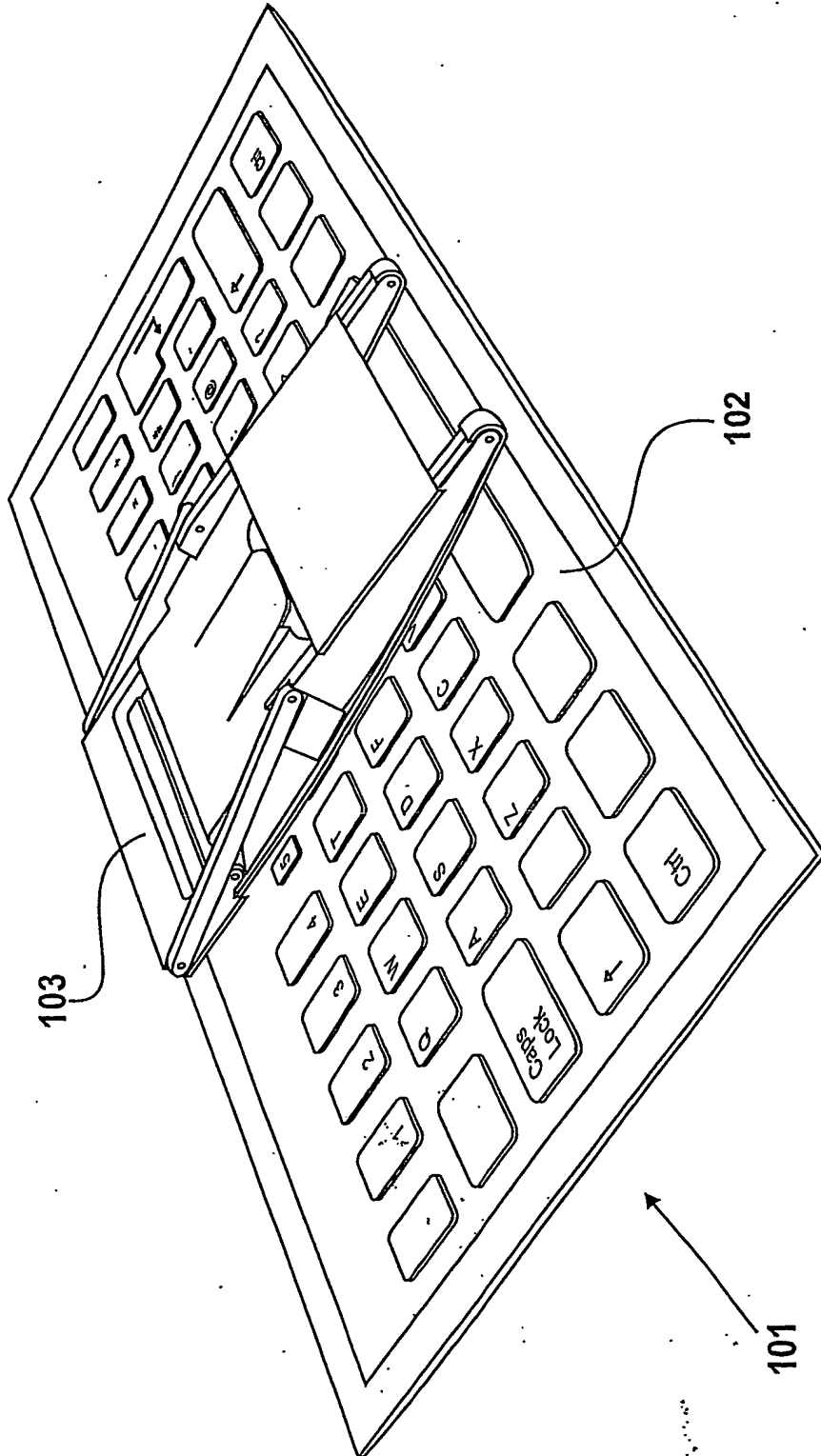


Figure 1

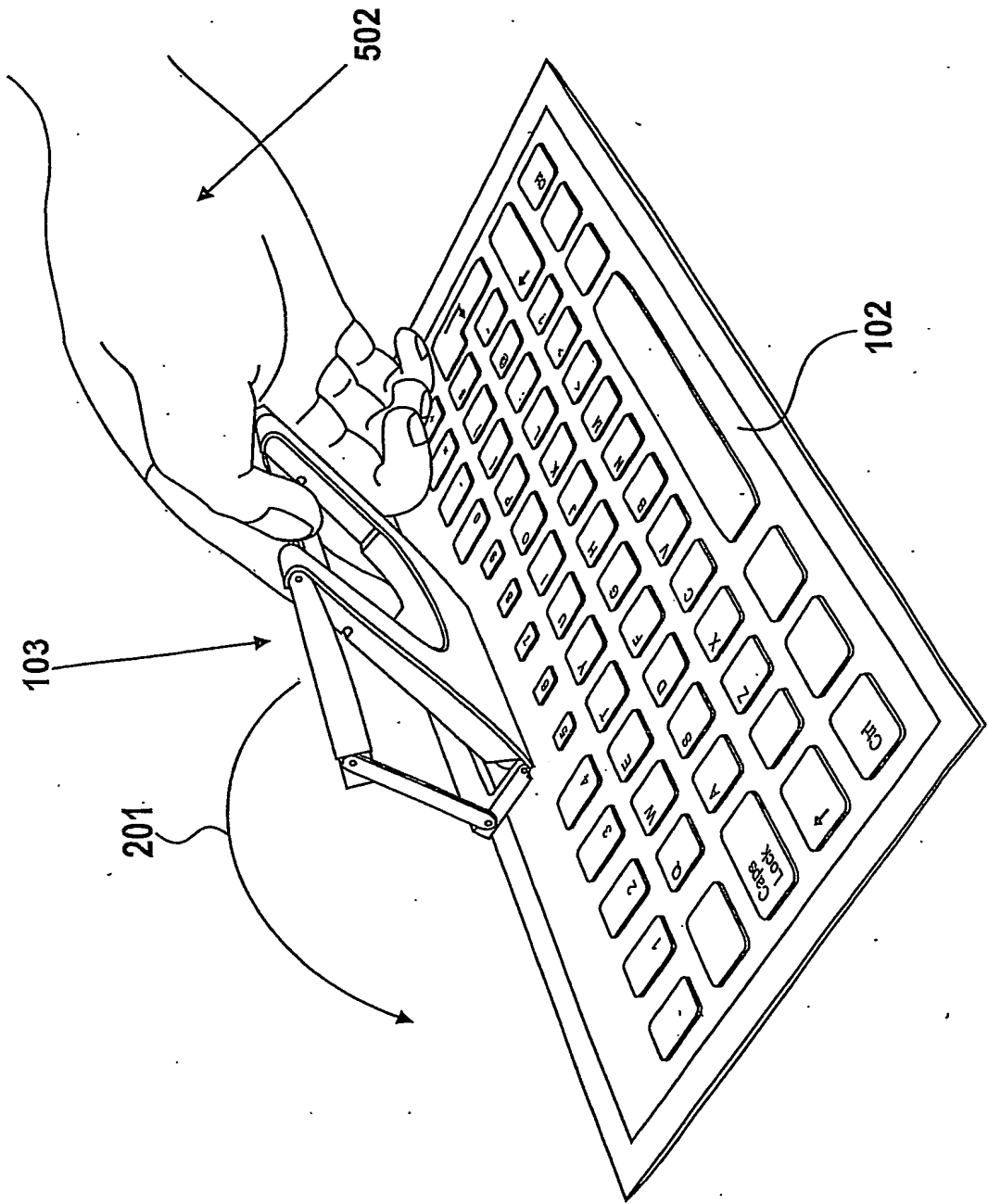


Figure 2

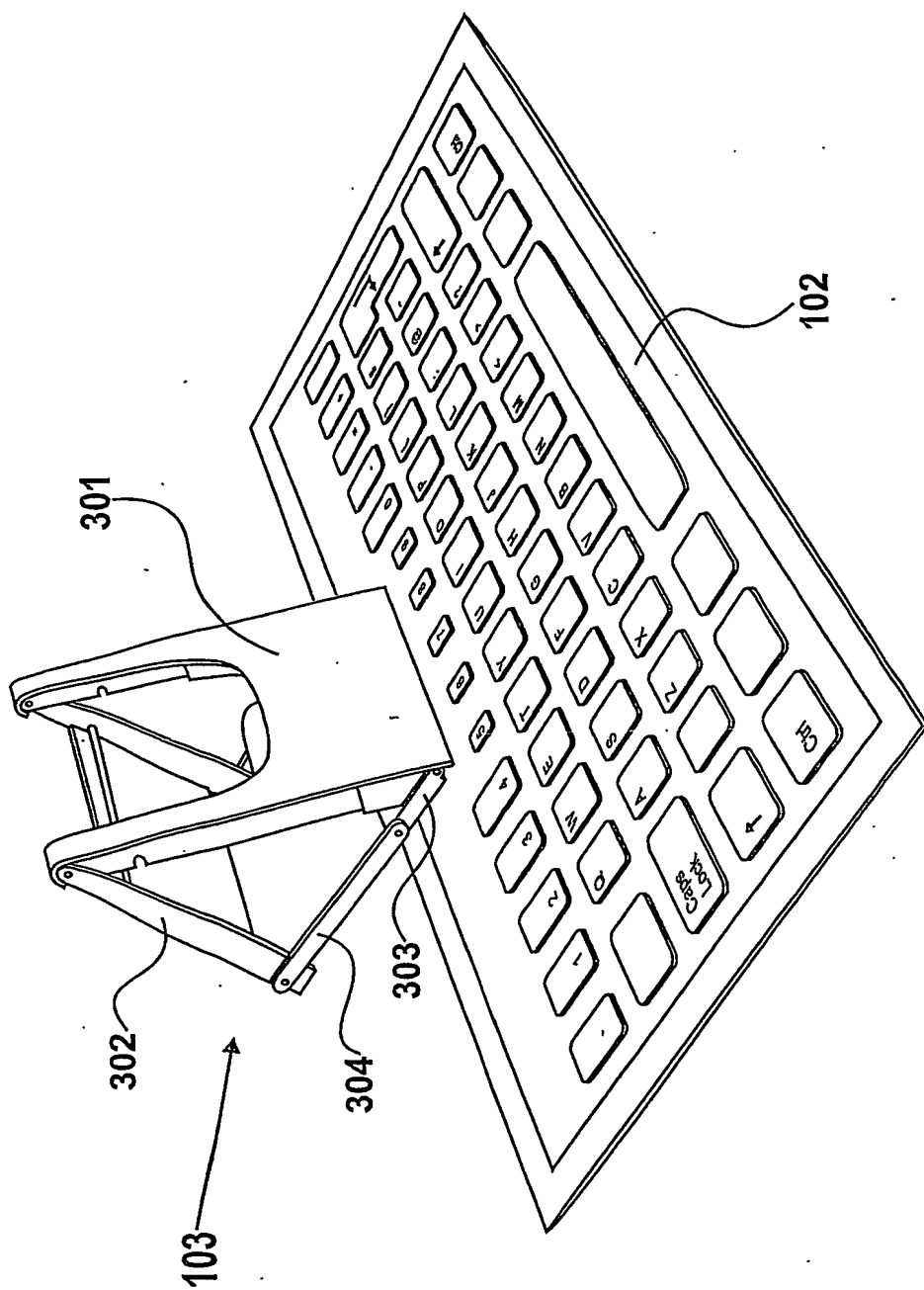


Figure 3

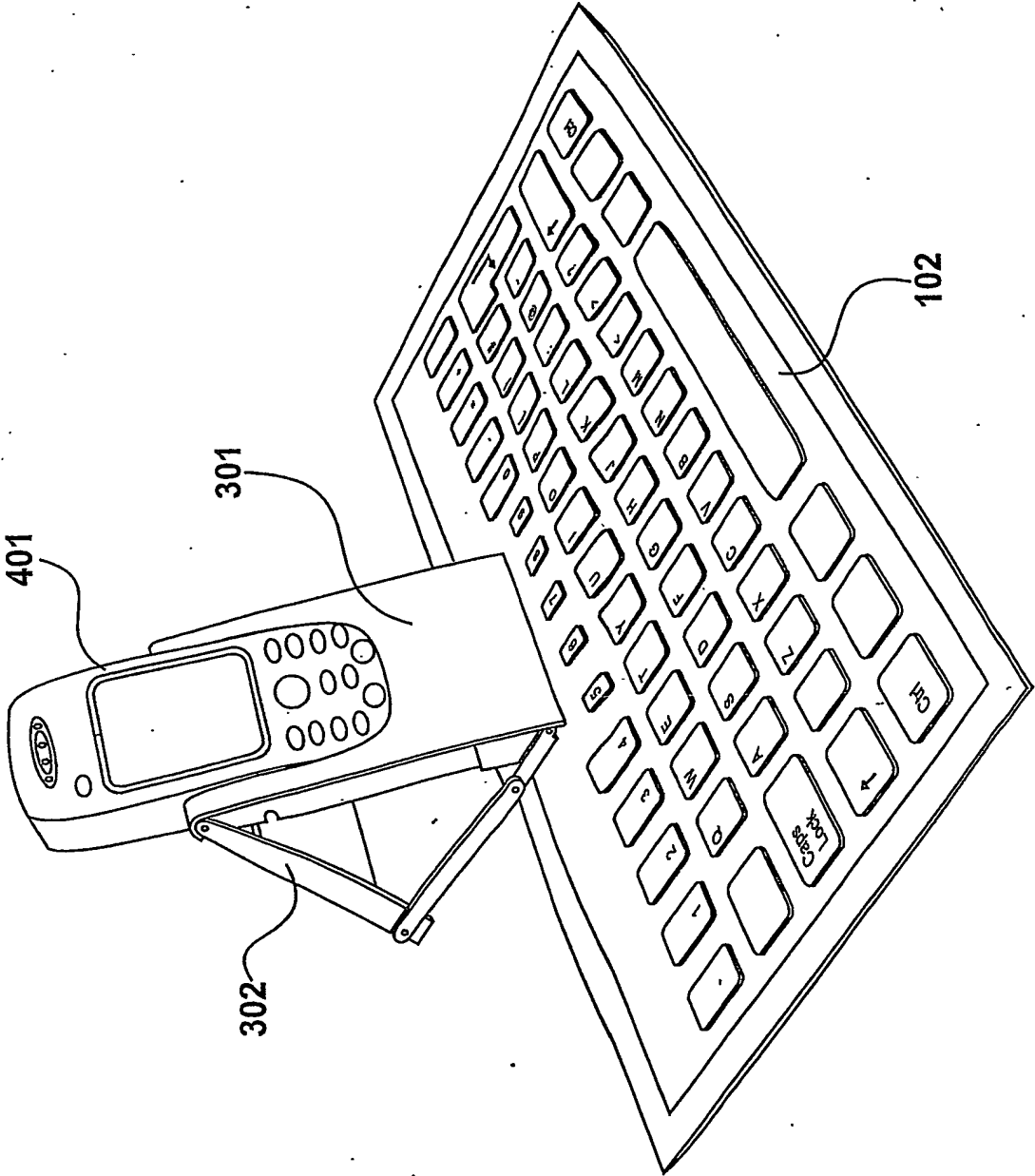


Figure 4

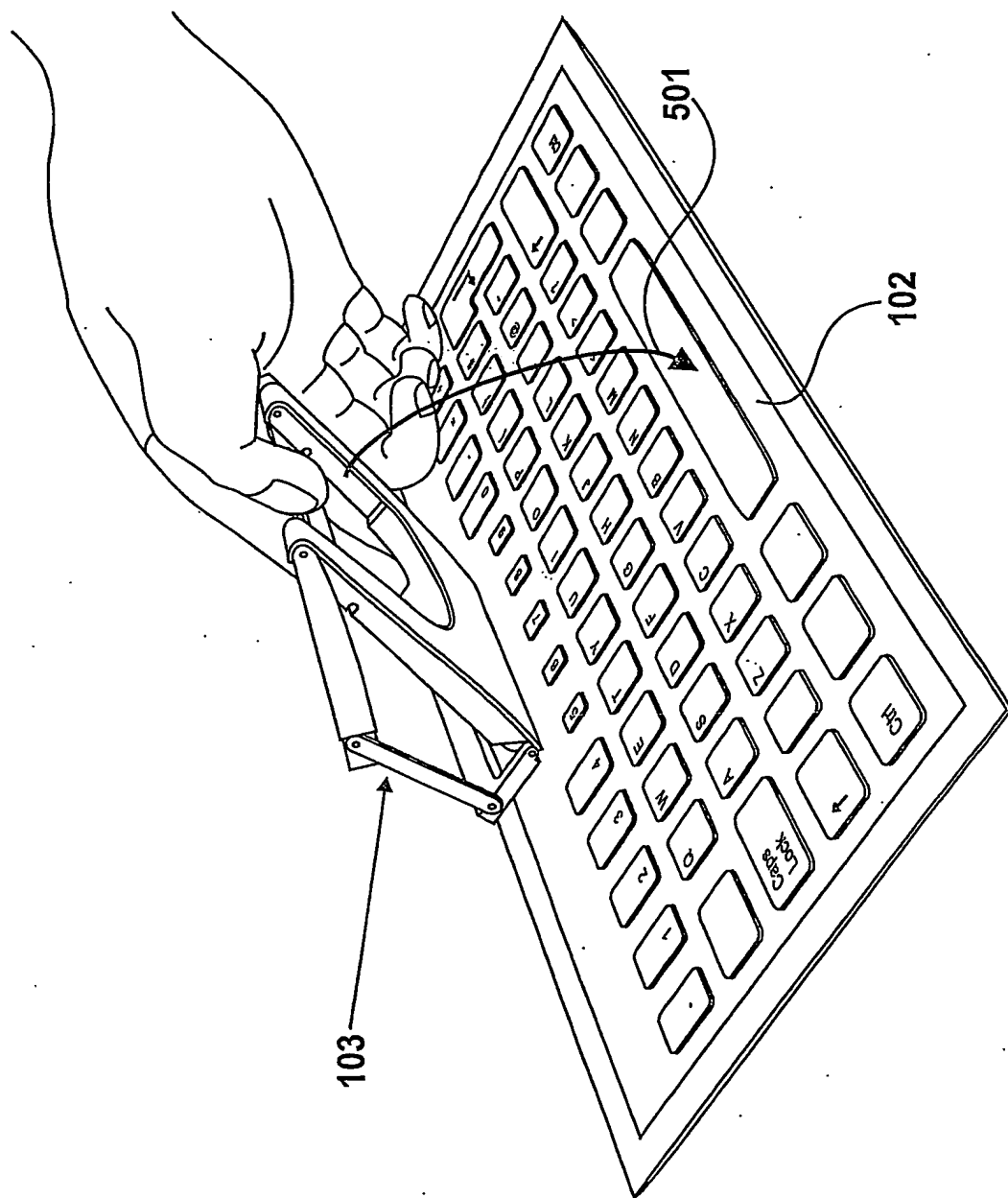


Figure 5

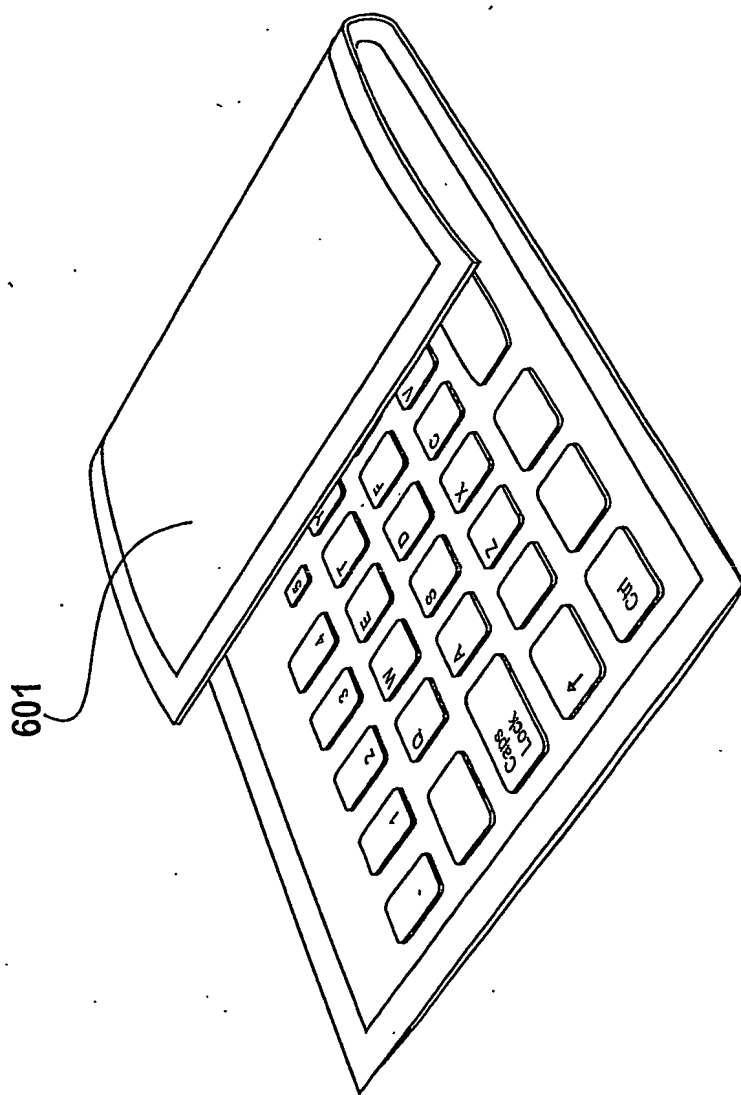


Figure 6



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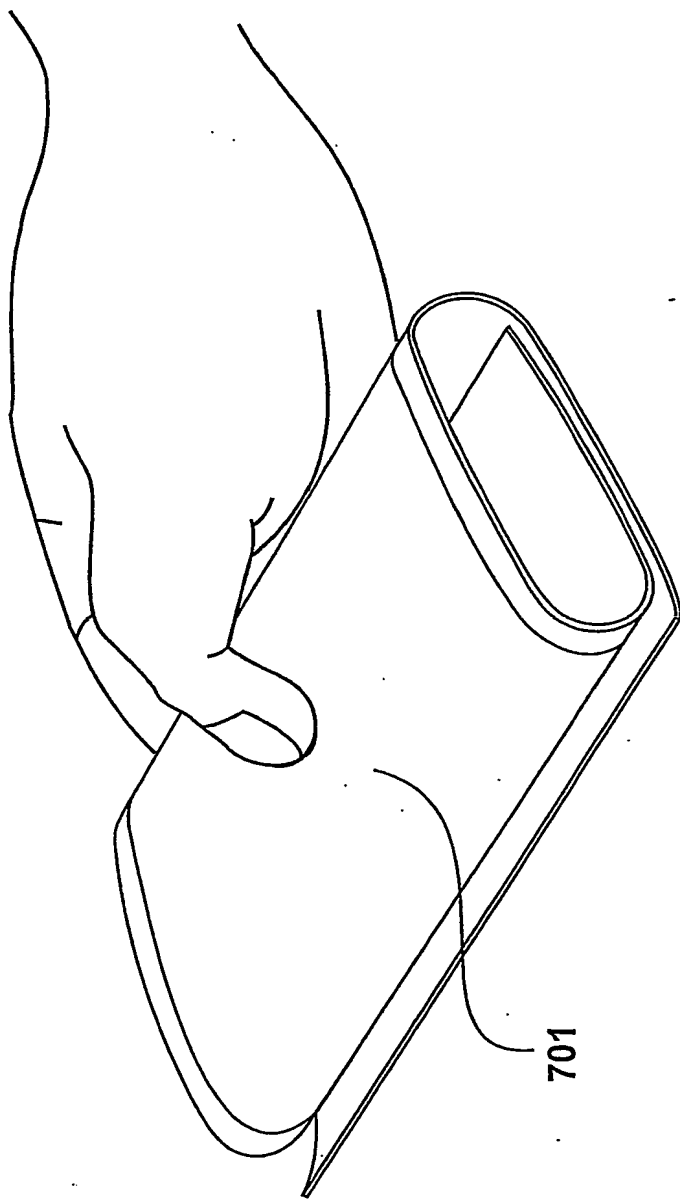


Figure 7

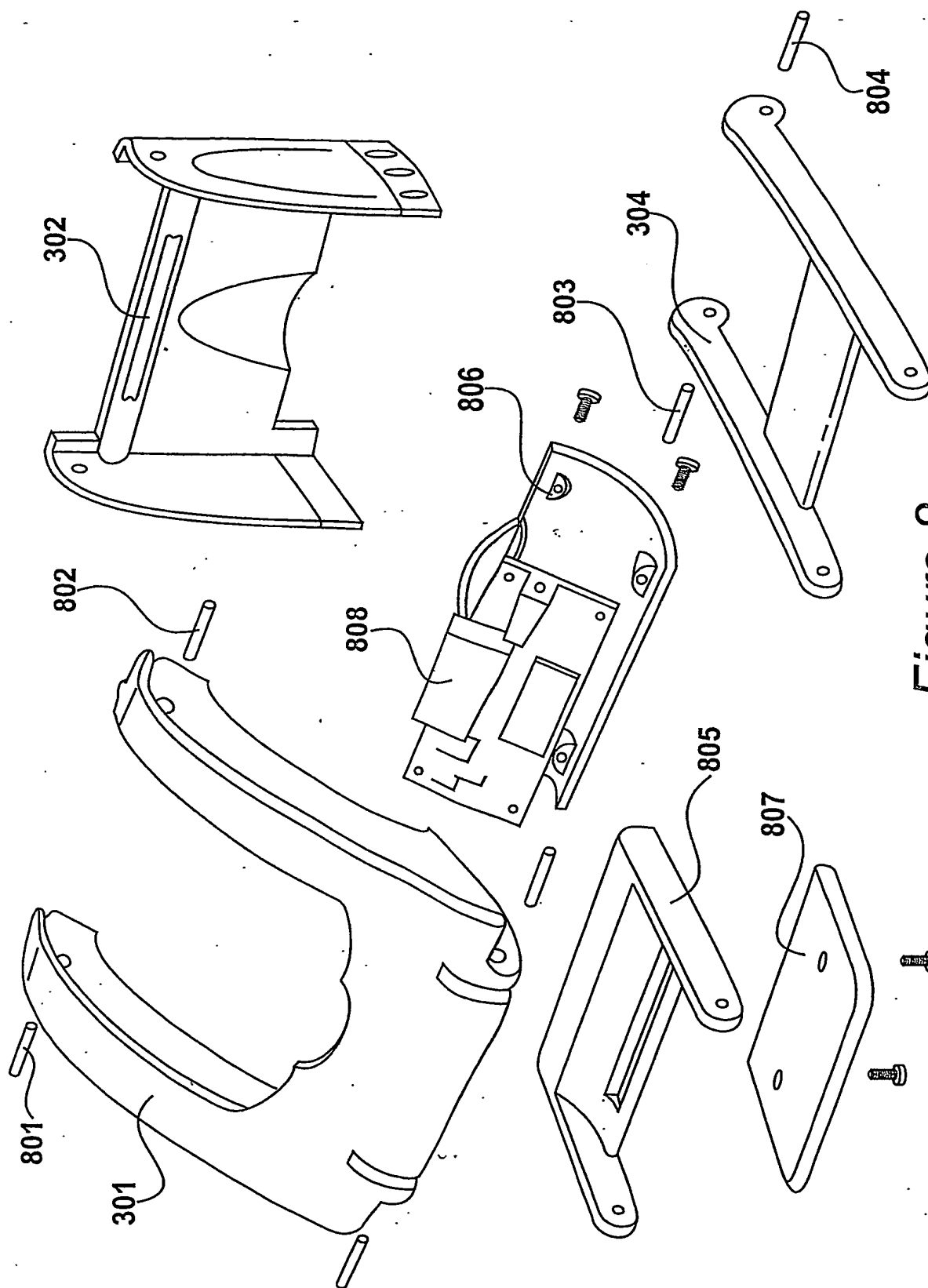


Figure 8

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